IN THE CLAIMS

1. (Previously presented) Apparatus for leak detection comprising:

a test line configured to receive a sample containing a trace gas;

a mass spectrometer configured to detect the trace gas and having an inlet for receiving the trace gas;

a first vacuum pump characterized by a relatively high reverse flow rate for light gases and a relatively low reverse flow rate for heavy gases, said first vacuum pump having a pump inlet and a foreline, the pump inlet being coupled to the inlet of said mass spectrometer;

a foreline valve coupled between the foreline of said first vacuum pump and the test line;

a trace gas permeable member coupled between the test line and the inlet of said mass spectrometer, the trace gas permeable member allowing the trace gas to pass and blocking other gases, liquids and particles; and

a second vacuum pump having an inlet coupled to the test line.

2. (Canceled).

3. (Original) Apparatus as defined in claim 1, wherein the permeable member comprises a quartz member.

4. (Original) Apparatus as defined in claim 1, wherein the permeable member comprises a quartz member, the apparatus further comprising a heating element in thermal contact with the quartz member and a controller configured to control the heating element.

5. (Original) Apparatus as defined in claim 1, wherein a trace gas permeability of the permeable member is controllable.

6. (Original) Apparatus as defined in claim 1, wherein the permeable member is controllable, further comprising a controller configured to increase the trace gas permeability of the permeable member and to close said foreline valve at relatively high pressures in the test line and configured to

decrease the trace gas permeability of the permeable member and to open said foreline valve at relatively low pressures in the test line.

7. (Original) Apparatus as defined in claim 1, wherein the first vacuum pump comprises a turbomolecular pump.

8. (Original) Apparatus as defined in claim 1, wherein the first vacuum pump comprises a diffusion pump.

9. (Original) Apparatus as defined in claim 1, wherein the first vacuum pump comprises a hybrid vacuum pump including axial pumping stages and one or more molecular drag stages.

10. (Previously presented) A method for leak detection, comprising:

pumping gas from a test volume through a test line;

at relatively high pressures in the test line, passing a first portion of the pumped gas through a trace gas permeable member to a mass spectrometer, the trace gas permeable member allowing the trace gas to pass and blocking other gases, liquids and particles; and

at relatively low pressures in the test line, passing a second portion of the pumped gas in reverse direction through a vacuum pump to the mass spectrometer, the vacuum pump characterized by a relatively high reverse flow rate for light gases and a relatively low reverse flow rate for heavy gases.

11. (Currently amended) A method as defined in claim 10, wherein passing [[a]]the second portion of the pumped gas in reverse direction through [[a]]the vacuum pump comprises providing a foreline valve coupled between a foreline of the vacuum pump and the test line, closing the foreline valve at relatively high pressures in the test line and opening the foreline valve at relatively low pressures in the test line.

12. (Currently amended) A method as defined in claim 10, wherein passing [[a]]the first portion of the pumped gas through [[a]]the trace gas permeable member comprises controlling the permeable member between high trace gas permeability at relatively high pressures in the test line and low trace gas permeability at relatively low pressures in the test line.

13. (Currently amended) A method as defined in claim ~~10~~12, wherein controlling the permeable member comprises heating the permeable member.

14. (Original) A method as defined in claim 10, further comprising detecting gas directed through the trace gas permeable member at relatively high pressures in the test line to identify a large leak.

15. (Currently amended) A method as defined in claim 10, wherein passing the first portion of the pumped gas through [[a]]the trace gas permeable member comprises increasing the permeability of the permeable member and closing a foreline valve coupled between a foreline of the vacuum pump and the test line, and wherein passing [[a]]the second portion of the pumped gas in reverse direction through [[a]]the vacuum pump comprises decreasing the permeability of the permeable member and opening the foreline valve.

16. (Previously presented) Apparatus for leak detection comprising:

a test line configured to receive a sample containing a trace gas;

a mass spectrometer configured to detect the trace gas and having an inlet for receiving the trace gas;

a first vacuum pump characterized by a relatively high reverse flow rate for light gases and a relatively low reverse flow rate for heavy gases, said first vacuum pump having a pump inlet and a foreline, the pump inlet being coupled to the inlet of said mass spectrometer;

a second vacuum pump configured to back the first vacuum pump; and

a trace gas permeable member coupled between the test line and the foreline, the trace gas permeable member allowing the trace gas to pass and blocking other gases, liquids and particles.

17. (Original) Apparatus as defined in claim 16, wherein the first vacuum pump comprises a turbomolecular pump.

18. (Original) Apparatus as defined in claim 16, further comprising a bypass valve coupled in parallel with the trace gas permeable member.

19. (Original) Apparatus as defined in claim 16, further comprising a roughing pump coupled to the test line.

20. (Previously presented) Apparatus for leak detection comprising:

a test line configured to receive a sample containing a trace gas;

a mass spectrometer configured to detect the trace gas and having an inlet for receiving the trace gas;

a turbomolecular vacuum pump having a pump inlet, a midstage line and a foreline, the pump inlet being coupled to the inlet of the mass spectrometer;

a forepump configured to back the turbomolecular vacuum pump; and

a trace gas permeable member coupled between the test line and the midstage line of the turbomolecular vacuum pump, the trace gas permeable member allowing the trace gas to pass and blocking other gases, liquids and particles.

21. (Original) Apparatus as defined in claim 20, further comprising a bypass valve coupled in parallel with the trace gas permeable member.

22. (Original) Apparatus as defined in claim 20, further comprising a roughing pump coupled to the test line.